WHAT IS CLAIMED IS:

1. A method of determining a Slow-Wave-Sleep (SWS) period and a Non-SWS (NSWS) period from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the method comprising:

extracting a series of cardiac R-R intervals from the signals and obtaining a time-frequency decomposition from said series of cardiac R-R intervals; and

using said time-frequency decomposition to determine the SWS period;

thereby determining the SWS period and the NSWS period of the sleeping subject.

2. The method of claim 1, wherein said obtaining said time-frequency decomposition comprises calculating, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

3. The method of claim 2, wherein the SWS period is defined by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

4. The method of claim 3, wherein said combination is a ratio.

5. The method of claim 2, wherein said predetermined threshold is constant.

6. The method of claim 2, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

7. The method of claim 6, wherein said first function is a linear function.

8. The method of claim 2, wherein said predetermined threshold varies with time.

9. The method of claim 2, wherein at least one of said VLF, said LF and said HF power spectra are calculated within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

10. The method of claim 9, wherein said function of said respective frequency is inversely related to said respective frequency.

11. The method of claim 9, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

12. The method of claim 9, further comprising determining a frequency resolution.

13. The method of claim 12, wherein said frequency resolution is from 0.001 Hz to 0.03 Hz.

14. The method of claim 9, further comprising determining a time resolution.

15. The method of claim 14, wherein said time resolution is from 1 second to 30 seconds.

16. The method of claim 9, further comprising determining an onset and a termination of said time-dependent power spectra.

17. The method of claim 9, wherein at least one of said VLF, said LF and said HF power spectra are calculated by a wavelet transform.

18. The method of claim 17, wherein said wavelet transform is selected from the group consisting of a discrete wavelet transform and a continuous wavelet transform.

19. The method of claim 9, wherein at least one of said VLF, said LF and said HF power spectra are calculated by a selective discrete spectral transform.

20. The method of claim 19, wherein said selective discrete spectral transform is selected from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

21. A method of determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the method comprising:

extracting a plurality of electromyogram (EMG) parameters from the signals; and

using said plurality of EMG parameters to determine at least one REM period;

thereby determining the REM sleep and the NREM sleep of the sleeping subject.

22. The method of claim 21, wherein said extracting said plurality of EMG parameters is effected by at least one procedure selected from the group consisting of: eliminating P waves, eliminating T waves and eliminating QRS-complexes from the signals.

23. The method of claim 22, wherein said eliminating P waves and said eliminating T waves from the signals is by high pass filtering.

24. The method of claim 23, wherein said high pass filtering is at a threshold frequency of about 10 Hz.

25. The method of claim 22, wherein said eliminating QRS-complexes is by a combination of gating and/or subtraction.

26. The method of claim 21, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG), normalized mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

27. The method of claim 21, wherein the REM sleep is defined by a plurality of epochs, each characterized by at least one of said plurality of EMG parameters which is below a predetermined threshold.

28. A method of determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the method comprising:

extracting a series of cardiac R-R intervals from the signals;

constructing a Poincare plot of said series of cardiac R-R intervals; and

using said Poincare plot to determine the REM sleep and the NREM sleep of the sleeping subject.

29. The method of claim 28, further comprising calculating a plurality of moments with respect to a predetermined line along said Poincare plot, each of said plurality of moments being calculated within a predetermined time-window.

30. The method of claim 29, wherein said plurality of moments is a plurality of moments of inertia.

31. The method of claim 29, wherein the REM sleep is defined by a plurality of epochs, each characterized by a moment which is below a predetermined threshold.

32. The method of claim 29, wherein said predetermined line along said Poincare plot is a straight line, forming a predetermined angle with respect to an axis of said Poincare plot.

33. The method of claim 32, wherein said predetermined angle equals about 45 degrees.

34. The method of claim 29, further comprising normalizing each of said plurality of moments.

35. A method of determining sleep stages from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the method comprising:

extracting a series of cardiac R-R intervals from the signals and obtaining a time-frequency decomposition from said series of cardiac R-R intervals;

using said time-frequency decomposition to determine at least one Slow-Wave-Sleep (SWS) period and at least one Non-SWS (NSWS) period;

from said at least one NSWS period, determining at least one sleep-onset (SO) period and a plurality of non-sleep periods;

extracting a plurality of electromyogram (EMG) parameters from a portion of the signals, said portion corresponds to a NSWS period other than said at least one SO period and other than said plurality of non-sleep period;

using said plurality of EMG parameters to determine at least one REM period, thereby obtaining also at least one light-sleep (LS) period defined as a NSWS period other than said at least one SO period, other than said plurality of non-sleep periods and other than said at least one REM period;

thereby determining the sleep stages of the sleeping subject.

36. The method of claim 35, further comprising determining, from said at least one LS period, at least one Stage-2 period thereby obtaining also a Stage-1 period, said Stage-1 period being defined as a LS period other than said at least one Stage-2.

37. The method of claim 35, wherein said obtaining said time-frequency decomposition comprises calculating, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

38. The method of claim 37, wherein the SWS period is defined by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

39. The method of claim 38, wherein said combination is a ratio.

40. The method of claim 37, wherein said predetermined threshold is constant.

41. The method of claim 37, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

42. The method of claim 41, wherein said first function is a linear function.

43. The method of claim 37, wherein said predetermined threshold varies with time.

44. The method of claim 37, wherein at least one of said VLF, said LF and said HF power spectra are calculated within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

45. The method of claim 44, wherein said function of said respective frequency is inversely related to said respective frequency.

46. The method of claim 44, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

47. The method of claim 44, further comprising determining a frequency resolution.

48. The method of claim 47, wherein said frequency resolution is from 0.001 Hz to 0.03 Hz.

49. The method of claim 44, further comprising determining a time resolution.

50. The method of claim 49, wherein said time resolution is from 1 second to 30 seconds.

51. The method of claim 44, further comprising determining an onset and a termination of said time-dependent power spectra.

52. The method of claim 44, wherein at least one of said VLF, said LF and said HF power spectra are calculated by a wavelet transform.

53. The method of claim 52, wherein said wavelet transform is selected from the group consisting of a discrete wavelet transform and a continuous wavelet transform.

54. The method of claim 44, wherein at least one of said VLF, said LF and said HF power spectra are calculated by a selective discrete spectral transform.

55. The method of claim 54, wherein said selective discrete spectral transform is selected from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

56. The method of claim 37, wherein said determining at least one SO period comprises calculating at least one SO parameter and defining the SO period to be at least one epoch being characterized by at least one SO parameter which is above a predetermined threshold, over a predetermined time range.

57. The method of claim 56, wherein said predetermined time range is from 2 epochs to 10 epochs.

58. The method of claim 56, wherein said at least one SO parameter comprises at least one integrated power spectrum calculated by integrating at least one of said power spectra over predetermined frequency limits.

59. The method of claim 58, wherein said at least one SO parameter further comprises at least one time-dependent power ratio calculated using said at least one integrated power spectrum.

60. The method of claim 58, further comprising calculating said predetermined frequency limits.

61. The method of claim 60, wherein said calculating said predetermined frequency limits comprises obtaining a steady state power spectrum from series of cardiac R-R intervals, and applying a minimum-cross-entropy method on said steady state power spectrum, so as to provide said frequency limits.

62. The method of claim 61, wherein said minimum-cross-entropy method is executed so as to separate between frequency peaks of said steady state power spectrum.

63. The method of claim 56, further comprising normalizing said at least one SO parameter.

64. The method of claim 56, further comprising analyzing said at least one SO parameter using a plurality of statistical quantities.

65. The method of claim 64, wherein said plurality of statistical quantities selected from the group consisting of an average, a variance and a t-test.

66. The method of claim 35, wherein said plurality of non-sleep periods comprises at least one awakening period and/or at least one arousal period.

67. The method of claim 66, further comprising:

(a) filtering said series of cardiac R-R intervals using a low-pass-filter, thereby providing a first series of signals; and

(b) defining said at least one awakening period as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

68. The method of claim 67, wherein said low-pass-filter is at about 0.01 Hz.

69. The method of claim 67, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

70. The method of claim 66, further comprising:

(a) filtering said series of cardiac R-R intervals using a band-pass-filter, thereby providing a second series of signals; and

(b) defining said at least one arousal period as a plurality of epochs each associated with at least one of said second series of signals which is below a predetermined threshold.

71. The method of claim 70, wherein said band-pass-filter is characterized by a lower band limit of about 0.05 Hz and an upper band limit of about 0.2 Hz.

72. The method of claim 70, wherein said predetermined threshold is about 0.85 of an averaged value of said second series of signals.

73. The method of claim 35, wherein said extracting a plurality of EMG parameters is effected by at least one procedure selected from the group consisting of: eliminating P waves, eliminating T waves and eliminating QRS-complexes from the signals.

74. The method of claim 73, wherein said eliminating P waves and said eliminating T waves from the signals is by high pass filtering.

75. The method of claim 74, wherein said high pass filtering is at a threshold frequency of about 10 Hz.

76. The method of claim 73, wherein said eliminating QRS-complexes is by a combination of gating and/or subtraction.

77. The method of claim 35, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG), normalized

mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

78. The method of claim 35, wherein the REM sleep is defined by a plurality of epochs, each characterized by at least one of said plurality of EMG parameters which is below a predetermined threshold.

79. The method of claim 35, wherein said at least one Stage-2 period is defined by a plurality of epochs, each associated to a cardiac R-R interval corresponding to a K-complex.

80. The method of claim 79, wherein said cardiac R-R interval corresponding to said K-complex is characterized by a specific width and a specific depth.

81. A method of determining a body position or a change in the body position from signals of electrical activity recorded of a chest of a sleeping subject, the signals being characterized by QRS complexes, the method comprising:

extracting R-wave durations from the QRS complexes, thereby obtaining an R-wave duration (RWD) function; and

using said RWD function to determine the body position or the change in the body position of the sleeping subject.

82. The method of claim 81, wherein the change in the body position is defined when a change of said RWD function is above a predetermined threshold.

83. The method of claim 82, wherein said predetermined threshold is a standard deviation of said RWD function.

84. The method of claim 82, wherein said change of said RWD function is calculated using at least one local average of said RWD function.

85. The method of claim 82, wherein said change of said RWD function is defined as a difference between two local averages of said RWD function.

86. The method of claim 81, wherein the body position is one of two body positions.

87. The method of claim 86, wherein said two body positions, comprise a first body position, defined when a value of said RWD function is high and a second body position, defined when a value of said RWD function is low.

88. The method of claim 81, further comprising defining at least two segments of each of the QRS complexes and determining width of each of said at least two segments, thereby obtaining, for each QRS complex, a set of widths, said set being representative of the body position.

89. The method of claim 88, wherein each of said segments has a first endpoint and a second endpoint, said first and said second endpoints being characterized by a zero nth-order derivative of a respective R-wave of said QRS complex, where n is a positive integer.

90. The method of claim 81, wherein said at least two segments comprise a left segment and a right segment and the body position is one of four body positions.

91. The method of claim 90, wherein said four body positions comprise:

a first body position, defined when a value of said left segment is high and a value of said right segment is high;

a second body position, defined when a value of said left segment is low and a value of said right segment is high;

a third body position, defined when a value of said left segment is high and a value of said right segment is low; and

a fourth body position, defined when a value of said left segment is low and a value of said right segment is low.

92. The method of claim 88, further comprising applying a clustering procedure on each said sets of widths, so as to define a plurality of clusters, each one of said plurality of clusters corresponding to a different body position.

93. The method of claim 92, wherein said clustering procedure is selected from the group consisting of graph theory procedure, density estimation procedure, Potts-spins-based procedure, hierarchical procedure and partitional procedure.

94. The method of claim 93, wherein said partitioned procedure is selected from the group consisting of a *K*-means procedure, an adaptive K-means procedure, hard C-means procedure and fuzzy C-means procedure.

95. The method of claim 93, wherein said hierarchical procedure is selected from the group consisting of a nearest neighbor procedure and a minimal spanning tree procedure.

96. A method of characterizing a sleep of a sleeping subject, the method comprising:

calculating at least one autonomic balance index (ABI), each corresponding to a different sleep stage of the sleeping subject and being calculated using a weight of said sleep stage and at least one power parameter; and

using said at least one ABI for characterizing the sleep of the sleeping subject.

97. The method of claim 96, wherein if one or more of said at least one ABI is larger than a predetermined threshold then determining an obstructive sleep apnea for the sleeping subject.

98. The method of claim 96, further comprising summing said at least two ABIs thereby obtaining a total ABI.

99. The method of claim 98, wherein if said total ABI is larger than a predetermined threshold then determining an obstructive sleep apnea for the sleeping subject.

100. The method of claim 96, wherein said at least one power parameter is selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum, a high-frequency (HF) power spectrum and a combination between two of said VLF, said LF and said HF power spectra.

101. The method of claim 100, wherein said combination is a ratio.

102. The method of claim 96, wherein said sleep stage is selected from the group consisting of a Slow-Wave-Sleep (SWS), Rapid-Eye-Movement (REM) sleep and a light-sleep (LS).

103. The method of claim 102, further comprising determining periods of said SWS using time-frequency decomposition of a series of cardiac R-R intervals extracted from signals of electrical activity recorded of a chest of the sleeping subject.

104. The method of claim 102, further comprising determining periods of said REM sleep using a plurality of electromyogram (EMG) parameters extracted from signals of electrical activity recorded of a chest of the sleeping subject.

105. The method of claim 102, further comprising determining periods of said REM sleep using a Poincare plot of a series of cardiac R-R intervals extracted from signals of electrical activity recorded of a chest of the sleeping subject.

106. The method of claim 103, further comprising:

determining periods of sleep-onset (SO) and periods of non-sleep from said signals; and

determining periods of said REM sleep using a plurality of electromyogram (EMG) parameters extracted from a portion of the signals, said portion corresponding

to a period other than said SWS period, other than said SO periods and other than said non-sleep periods;

thereby obtaining also periods of said LS, defined as a period other than said SWS period, other than said SO periods, other than said non-sleep periods and other than said REM periods.

107. A method of determining a sleep apnea from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the method comprising:

(a) extracting a series of cardiac R-R intervals from the signals;

(b) determining awakening periods of the sleeping subject and excluding cardiac R-R intervals corresponding to said awakening periods from said series of cardiac R-R intervals;

(c) obtaining a power spectrum from said series of cardiac R-R intervals; and

(d) using said power spectrum to determine the sleep apnea of the sleeping subject.

108. The method of claim 107, further comprising determining body positions or a change in a body position of the sleeping subject prior to said step (b), and executing said steps (b)-(d) separately for each one of said body positions.

109. The method of claim 107, wherein said determining said awakening periods of said step (b) comprises:

(i) filtering said series of cardiac R-R intervals using a low-pass-filter, thereby providing a first series of signals; and

(ii) defining said awakening periods as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

110. The method of claim 109, wherein said low-pass-filter is at about 0.01 Hz.

111. The method of claim 109, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

112. The method of claim 107, wherein said obtaining said power spectrum is by a discrete transform.

113. The method of claim 112, wherein said discrete transform is selected from the group consisting of a steady state discrete transform and a time-dependent discrete transform.

114. The method of claim 112, wherein said discrete transform is selected from the group consisting of a discrete Fourier transform, a discrete Hartley transform, a discrete sine transform, a discrete cosine transform, a discrete Hadamard transform, a discrete Haar transform and a discrete wavelet transform.

115. The method of claim 107, wherein said step (d) comprises obtaining, for each period other than said awakening period, a power spectrum component of said power spectrum, and if said power spectrum component is above a predetermined threshold then identifying sleep apnea for said period.

116. The method of claim 115, wherein said power spectrum component is power of signals being at a frequency range representing sleep apnea.

117. The method of claim 116, wherein said frequency range is from about 0.01 Hz to about 0.04 Hz.

118. The method of claim 115, wherein said predetermined threshold is about half of a total power of said power spectrum.

119. The method of claim 108, further comprising:

employing a pattern recognition procedure on a portion of said series of cardiac R-R intervals, so as to identify representative patterns of sleep apnea; and

identifying periods corresponding to said representative patterns as sleep apnea periods.

120. The method of claim 119, wherein said portion of said series of cardiac R-R intervals corresponds to body positions having durations lower than a predetermined threshold.

121. The method of claim 120, wherein said predetermined threshold equals about 200 seconds plus total awakening time in a respective body position.

122. The method of claim 119, wherein said portion of said series of cardiac R-R intervals corresponds to periods characterized by a power spectrum component which is below a predetermined threshold, said power spectrum component is power of signals being at a frequency range representing sleep apnea.

123. The method of claim 122, wherein said predetermined threshold is about half of a total power of said power spectrum.

124. The method of claim 119, wherein said representative patterns are characterized by a U-shape of said cardiac R-R intervals.

125. The method of claim 107, further comprising discarding signals corresponding to abnormal heart beats of the sleeping subject, prior to said step (a).

126. The method of claim 107, further comprising interpolating the signals so as to compensate missing heart beats of the sleeping subject, prior to said step (a).

127. An apparatus for determining a Slow-Wave-Sleep (SWS) period and a Non-SWS (NSWS) period from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the apparatus comprising:

an R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a decomposer for obtaining a time-frequency decomposition from said series of cardiac R-R intervals; and

an SWS determinator, for determining the SWS period using said time-frequency decomposition;

thereby to determine the SWS period and the NSWS period of the sleeping subject.

128. The apparatus of claim 127, wherein said decomposer is operable to calculate, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

129. The apparatus of claim 128, wherein said SWS determinator is programmed to define the SWS period by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

130. The apparatus of claim 129, wherein said combination is a ratio.

131. The apparatus of claim 128, wherein said predetermined threshold is constant.

132. The apparatus of claim 128, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

133. The apparatus of claim 132, wherein said first function is a linear function.

134. The apparatus of claim 128, wherein said predetermined threshold varies with time.

135. The apparatus of claim 128, wherein said decomposer is operable to calculate said VLF, said LF and said HF power spectra within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

136. The apparatus of claim 135, wherein said function of said respective frequency is inversely related to said respective frequency.

137. The apparatus of claim 135, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

138. The apparatus of claim 135, wherein said decomposer comprises a wavelet processor.

139. The apparatus of claim 138, wherein said wavelet processor is selected from the group consisting of a discrete wavelet processor and a continuous wavelet processor.

140. The apparatus of claim 135, wherein said decomposer comprises a selective discrete spectral processor.

141. The apparatus of claim 140, wherein said decomposer further comprises a spectral transform selector for selecting a transform from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

142. An apparatus for determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the apparatus comprising:

an electromyogram (EMG) extractor for extracting a plurality of EMG parameters from the signals; and

a REM determinator for using said plurality of EMG parameters to determine the REM sleep and the NREM sleep of the sleeping subject.

143. The apparatus of claim 142, wherein said EMG extractor comprises an eliminator for eliminating at least one signal selected from the group consisting of: a P wave, a T wave and a QRS-complex.

144. The apparatus of claim 143, wherein said eliminator comprises at least one high pass filter for filtering out said P wave and said T wave.

145. The apparatus of claim 144, wherein said high pass filter is characterized by a threshold frequency of about 10 Hz.

146. The apparatus of claim 143, wherein said eliminator is operable comprises to eliminate said QRS-complex by a combination of gating and/or subtraction.

147. The apparatus of claim 142, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG), normalized mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

148. The apparatus of claim 142, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by

at least one of said plurality of EMG parameters which is below a predetermined threshold.

149. An apparatus for determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the apparatus comprising:

an R-R extractor, for extracting a series of cardiac R-R intervals from the signals;

a plotter, for constructing a Poincare plot of said series of cardiac R-R intervals; and

a REM determinator, for using said Poincare plot to determine the REM sleep and the NREM sleep of the sleeping subject.

150. The apparatus of claim 149, further comprising electronic-calculating functionality for calculating a plurality of moments with respect to a predetermined line along said Poincare plot, each of said plurality of moments being calculated within a predetermined time-window.

151. The apparatus of claim 150, wherein said plurality of moments is a plurality of moments of inertia.

152. The apparatus of claim 150, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by a moment which is below a predetermined threshold.

153. The apparatus of claim 150, wherein said predetermined line along said Poincare plot is a straight line, forming a predetermined angle with respect to an axis of said Poinçare plot.

154. The apparatus of claim 153, wherein said predetermined angle equals about 45 degrees.

155. The apparatus of claim 150, further comprising electronic-calculating functionality for normalizing each of said plurality of moments.

156. An apparatus for determining sleep stages from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the apparatus comprising:

a R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a decomposer, for obtaining a time-frequency decomposition from said series of cardiac R-R intervals;

a Slow-Wave-Sleep (SWS) determinator for using said time-frequency decomposition to determine at least one SWS period and at least one Non-SWS (NSWS) period;

a sleep-onset (SO) determinator for determining at least one SO period onset period from said at least one NSWS period;

a non-sleep determinator for determining plurality of non-sleep periods from said at least one NSWS period;

an electromyogram (EMG) extractor, for extracting a plurality of EMG parameters from a portion of the signals, said portion corresponds to a NSWS period other than said at least one SO period and other than said plurality of non-sleep periods;

a Rapid-Eye-Movement (REM) determinator for using said plurality of EMG parameters to determine at least one REM period, thereby to obtain also at least one LS period defined as a NSWS period other than said at least one SO period, other than said plurality of non-sleep periods and other than said at least one REM period;

thereby to determine the sleep stages of the sleeping subject.

157. The apparatus of claim 156, further comprising a Stage-2 determinator for determining, from said at least one LS period, at least one Stage-2 period, thereby to obtain also a Stage-1 period, said Stage-1 period being defined as a LS period other than at least one Stage-2 period.

158. The apparatus of claim 156, wherein said decomposer is operable to calculate, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

159. The apparatus of claim 158, wherein said SWS determinator is programmed to define the SWS period by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

160. The apparatus of claim 159, wherein said combination is a ratio.

161. The apparatus of claim 158, wherein said predetermined threshold is constant.

162. The apparatus of claim 158, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

163. The apparatus of claim 162, wherein said first function is a linear function.

164. The apparatus of claim 158, wherein said predetermined threshold varies with time.

165. The apparatus of claim 158, wherein said decomposer is operable to calculate said VLF, said LF and said HF power spectra within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

166. The apparatus of claim 165, wherein said function of said respective frequency is inversely related to said respective frequency.

167. The apparatus of claim 165, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

168. The apparatus of claim 165, wherein said decomposer comprises a wavelet processor.

169. The apparatus of claim 168, wherein said wavelet processor is selected from the group consisting of a discrete wavelet processor and a continuous wavelet processor.

170. The apparatus of claim 165, wherein said decomposer comprises a selective discrete spectral processor.

171. The apparatus of claim 170, wherein said decomposer further comprises a spectral transform selector for selecting a transform from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

172. The apparatus of claim 158, wherein said SO determinator comprises electronic-calculating functionality for calculating at least one SO parameter and for defining the SO period to be at least one epochs being characterized by at least one SO parameter which is above a predetermined threshold, over a predetermined time range.

173. The apparatus of claim 172, wherein said predetermined time range is from 2 epochs to 10 epochs.

174. The apparatus of claim 172, wherein said at least one SO parameter comprises at least one integrated power spectrum calculated by integrating at least one of said power spectra over predetermined frequency limits.

175. The apparatus of claim 174, wherein said at least one SO parameter further comprises at least one time-dependent power ratio calculated using said at least one integrated power spectrum.

176. The apparatus of claim 174, wherein said SO determinator further comprises electronic-calculating functionality for calculating said predetermined frequency limits.

177. The apparatus of claim 172, further comprising electronic-calculating functionality for normalizing said at least one SO parameter.

178. The apparatus of claim 172, further comprising a statistical analyzer for analyzing said at least one SO parameter using a plurality of statistical quantities.

179. The apparatus of claim 178, wherein said plurality of statistical quantities selected from the group consisting of an average, a variance and a t-test.

180. The apparatus of claim 156, wherein said plurality of non-sleep periods comprises at least one awakening period and/or at least one arousal period.

181. The apparatus of claim 180, wherein said non-sleep determinator comprises:

(a) a low-pass filter for filtering said series of cardiac R-R intervals, thereby to provide a first series of signals; and

(b) an awakening period definer for defining said at least one awakening period as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

182. The apparatus of claim 181, wherein said low-pass-filter is at about 0.01 Hz.

183. The apparatus of claim 181, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

184. The apparatus of claim 180, wherein said non-sleep determinator comprises:

(a) a band-pass-filter for filtering said series of cardiac R-R intervals, thereby providing a second series of signals; and

(b) an arousal period definer for defining said at least one arousal period as a plurality of epochs each associated with at least one of said second series of signals which is below a predetermined threshold.

185. The apparatus of claim 184, wherein said band-pass-filter is characterized by a lower band limit of about 0.05 Hz and an upper band limit of about 0.2 Hz.

186. The apparatus of claim 184, wherein said predetermined threshold is about 0.85 of an averaged value of said second series of signals.

187. The apparatus of claim 180, wherein said predetermined profile is characterized by a specific width and a specific depth.

188. The apparatus of claim 156, wherein said EMG extractor comprises an eliminator for eliminating at least one signal selected from the group consisting of: a P wave, a T wave and a QRS-complex.

189. The apparatus of claim 188, wherein said eliminator comprises at least one high pass filter for filtering out said P wave and said T wave.

190. The apparatus of claim 189, wherein said high pass filter is characterized by a threshold frequency of about 10 Hz.

191. The apparatus of claim 188, wherein said eliminator is operable comprises to eliminate said QRS-complex by a combination of gating and/or subtraction.

192. The apparatus of claim 156, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG), normalized mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

193. The apparatus of claim 156, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by at least one of said plurality of EMG parameters which is below a predetermined threshold.

194. The apparatus of claim 156, wherein said Stage-2 determinator is programmed to define said at least one Stage-2 period by a plurality of epochs, each associated to a cardiac R-R interval corresponding to a K-complex.

195. The apparatus of claim 194, wherein said cardiac R-R interval corresponding to said K-complex is characterized by a specific width and a specific depth.

196. A system for determining a Slow-Wave-Sleep (SWS) period and a Non-SWS (NSWS) period of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, measured over a plurality of epochs;

an R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a decomposer for obtaining a time-frequency decomposition from said series of cardiac R-R intervals; and

an SWS determinator, for determining the SWS period using said time-frequency decomposition;

thereby to determine the SWS period and the NSWS period of the sleeping subject.

197. The system of claim 196, wherein said apparatus for providing signals is an electrocardiogram (ECG) apparatus.

198. The system of claim 196, wherein said apparatus for providing signals comprises a single lead, adapted for attachment to a predetermined location on the chest of the sleeping subject, said predetermined location is selected so as to substantially optimize said signals.

199. The system of claim 196, wherein said apparatus for providing signals comprises cardiac electrodes, adapted for attachment to a plurality of predetermined locations on the chest of the sleeping subject, said plurality of predetermined locations are selected so as to substantially optimize said signals.

200. The system of claim 199, wherein each of said plurality of predetermined locations is adjacent to a different muscle.

201. The system of claim 199, wherein at least two of said plurality of predetermined locations are adjacent to the same muscle.

202. The system of claim 196, wherein said decomposer is operable to calculate, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

203. The system of claim 202, wherein said SWS determinator is programmed to define the SWS period by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

204. The system of claim 203, wherein said combination is a ratio.

205. The system of claim 202, wherein said predetermined threshold is constant.

206. The system of claim 202, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

207. The system of claim 206, wherein said first function is a linear function.

208. The system of claim 202, wherein said predetermined threshold varies with time.

209. The system of claim 202, wherein said decomposer is operable to calculate said VLF, said LF and said HF power spectra within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

210. The system of claim 209, wherein said function of said respective frequency is inversely related to said respective frequency.

211. The system of claim 209, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a

Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

212. The system of claim 209, wherein said decomposer comprises a wavelet processor.

213. The system of claim 212, wherein said wavelet processor is selected from the group consisting of a discrete wavelet processor and a continuous wavelet processor.

214. The system of claim 209, wherein said decomposer comprises a selective discrete spectral processor.

215. The system of claim 214, wherein said decomposer further comprises a spectral transform selector for selecting a transform from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

216. A system for determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, measured over a plurality of epochs;

an electromyogram (EMG) extractor for extracting a plurality of EMG parameters from the signals; and

a REM determinator for using said plurality of EMG parameters to determine the REM sleep and the NREM sleep of the sleeping subject.

217. The system of claim 216, wherein said apparatus for providing signals is an electrocardiogram (ECG) apparatus.

218. The system of claim 216, wherein said apparatus for providing signals comprises a single lead, adapted for attachment to a predetermined location on the

chest of the sleeping subject, said predetermined location is selected so as to substantially optimize heart-beat reads from said signals and to substantially optimize EMG reads from said signals.

219. The system of claim 216, wherein said apparatus for providing signals comprises cardiac electrodes, adapted for attachment to a plurality of predetermined locations on the chest of the sleeping subject, said plurality of predetermined locations are selected so as to substantially optimize heart-beat reads from said signals and to substantially optimize EMG reads from said signals.

220. The system of claim 219, wherein each of said plurality of predetermined locations is adjacent to a different muscle.

221. The system of claim 219, wherein at least two of said plurality of predetermined locations are adjacent to the same muscle.

222. The system of claim 216, wherein said EMG extractor comprises an eliminator for eliminating at least one signal selected from the group consisting of: a P wave, a T wave and a QRS-complex.

223. The system of claim 222, wherein said eliminator comprises at least one high pass filter for filtering out said P wave and said T wave.

224. The system of claim 223, wherein said high pass filter is characterized by a threshold frequency of about 10 Hz.

225. The system of claim 222, wherein said eliminator is operable comprises to eliminate said QRS-complex by a combination of gating and/or subtraction.

226. The system of claim 216, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG),

normalized mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

227. The system of claim 216, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by at least one of said plurality of EMG parameters which is below a predetermined threshold.

228. A system for determining a Rapid-Eye-Movement (REM) sleep and a Non-REM (NREM) sleep of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, measured over a plurality of epochs;

an R-R extractor, for extracting a series of cardiac R-R intervals from the signals;

a plotter, for constructing a Poincare plot of said series of cardiac R-R intervals; and

a REM determinator, for using said Poincare plot to determine the REM sleep and the NREM sleep of the sleeping subject.

229. The system of claim 228, wherein said apparatus for providing signals is an electrocardiogram (ECG) apparatus.

230. The system of claim 228, wherein said apparatus for providing signals comprises a single lead, adapted for attachment to a predetermined location on the chest of the sleeping subject, said predetermined location is selected so as to substantially optimize heart-beat reads from said signals.

231. The system of claim 228, wherein said apparatus for providing signals comprises cardiac electrodes, adapted for attachment to a plurality of predetermined locations on the chest of the sleeping subject, said plurality of predetermined

locations are selected so as to substantially optimize heart-beat reads from said signals.

232. The system of claim 231, wherein each of said plurality of predetermined locations is adjacent to a different muscle.

233. The system of claim 231, wherein at least two of said plurality of predetermined locations are adjacent to the same muscle.

234. The system of claim 228, further comprising electronic-calculating functionality for calculating a plurality of moments with respect to a predetermined line along said Poincare plot, each of said plurality of moments being calculated within a predetermined time-window.

235. The system of claim 234, wherein said plurality of moments is a plurality of moments of inertia.

236. The system of claim 234, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by a moment which is below a predetermined threshold.

237. The system of claim 234, wherein said predetermined line along said Poincare plot is a straight line, forming a predetermined angle with respect to an axis of said Poincare plot.

238. The system of claim 237, wherein said predetermined angle equals about 45 degrees.

239. The system of claim 234, further comprising electronic-calculating functionality for normalizing each of said plurality of moments.

240. A system for determining sleep stages of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, measured over a plurality of epochs;

an R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a decomposer, for obtaining a time-frequency decomposition from said series of cardiac R-R intervals;

a Slow-Wave-Sleep (SWS) determinator for using said time-frequency decomposition to determine at least one SWS period and at least one Non-SWS (NSWS) period;

a sleep-onset (SO) determinator for determining at least one SO period onset period from said at least one NSWS period;

a non-sleep determinator for determining a plurality of non-sleep periods from said at least one NSWS period;

an electromyogram (EMG) extractor, for extracting a plurality of EMG parameters from a portion of the signals, said portion corresponds to a NSWS period other than said at least one SO period and other than said plurality of non-sleep period;

a Rapid-Eye-Movement (REM) determinator for using said plurality of EMG parameters to determine at least one REM period, thereby to obtain also at least one LS period defined as a NSWS period other than said at least one SO period, other than said plurality of non-sleep periods and other than said at least one REM period;

thereby to determine the sleep stages of the sleeping subject.

241. The system of claim 240, wherein said apparatus for providing signals is an electrocardiogram (ECG) apparatus.

242. The system of claim 240, wherein said apparatus for providing signals comprises cardiac electrodes, adapted for attachment to a plurality of predetermined locations on the chest of the sleeping subject, said plurality of predetermined locations are selected so as to substantially optimize heart-beat reads from said signals and to substantially optimize EMG reads from said signals.

243. The system of claim 240, further comprising a Stage-2 determinator for determining, from said at least one LS period, at least one Stage-2 period, thereby to obtain also a Stage-1 period, said Stage-1 period being defined as a LS period other than at least one Stage-2 period.

244. The system of claim 240, wherein said decomposer is operable to calculate, for each epoch, at least one time-dependent power spectrum component selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum and a high-frequency (HF) power spectrum.

245. The system of claim 244, wherein said SWS determinator is programmed to define the SWS period by a plurality of epochs, each characterized by at least one power parameter which is below a predetermined threshold, said at least one power parameter is selected from the group consisting of said VLF power spectrum, said LF power spectrum, said HF power spectrum, and a combination between two of said VLF, said LF and said HF power spectra.

246. The system of claim 245, wherein said combination is a ratio.

247. The system of claim 244, wherein said predetermined threshold is constant.

248. The system of claim 244, wherein said predetermined threshold is a first function of an average value of said at least one power parameter.

249. The system of claim 248, wherein said first function is a linear function.

250. The system of claim 244, wherein said predetermined threshold varies with time.

251. The system of claim 244, wherein said decomposer is operable to calculate said VLF, said LF and said HF power spectra within a window along said series of cardiac R-R intervals, said window being characterized by a duration which is a function of a respective frequency.

252. The system of claim 251, wherein said function of said respective frequency is inversely related to said respective frequency.

253. The system of claim 251, wherein said window has an aperture selected from the group consisting of: a rectangular aperture, a Hamming aperture, a Hanning aperture, a Blackman aperture, a Gaussian window, a Lorentzian window, a sinc window, a power of a sine window and a power of a cosine window.

254. The system of claim 251, wherein said decomposer comprises a wavelet processor.

255. The system of claim 254, wherein said wavelet processor is selected from the group consisting of a discrete wavelet processor and a continuous wavelet processor.

256. The system of claim 251, wherein said decomposer comprises a selective discrete spectral processor.

257. The system of claim 256, wherein said decomposer further comprises a spectral transform selector for selecting a transform from the group consisting of: a Fourier transform, a Haar transform, a Hartley transform, a sine transform, a cosine transform, and a Hadamard transform.

258. The system of claim 244, wherein said SO determinator comprises electronic-calculating functionality for calculating at least one SO parameter and for defining the SO period to be at least one epoch being characterized by at least one SO

parameter which is above a predetermined threshold, over a predetermined time range.

259. The system of claim 258, wherein said predetermined time range is from 2 epochs to 10 epochs.

260. The system of claim 258, wherein said at least one SO parameter comprises at least one integrated power spectrum calculated by integrating at least one of said power spectra over predetermined frequency limits.

261. The system of claim 260, wherein said at least one SO parameter further comprises at least one time-dependent power ratio calculated using said at least one integrated power spectrum.

262. The system of claim 260, wherein said SO determinator further comprises electronic-calculating functionality for calculating said predetermined frequency limits.

263. The system of claim 258, further comprising electronic-calculating functionality for normalizing said at least one SO parameter.

264. The system of claim 258, further comprising a statistical analyzer for analyzing said at least one SO parameter using a plurality of statistical quantities.

265. The system of claim 264, wherein said plurality of statistical quantities selected from the group consisting of an average, a variance and a t-test.

266. The system of claim 240, wherein said plurality of non-sleep periods comprises at least one awakening period and/or at least one arousal period.

267. The system of claim 266, wherein said non-sleep determinator comprises:

(a) a low-pass filter for filtering said series of cardiac R-R intervals, thereby to provide a first series of signals; and

(b) an awakening period definer for defining said at least one awakening period as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

268. The system of claim 267, wherein said low-pass-filter is at about 0.01 Hz.

269. The system of claim 267, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

270. The system of claim 266, wherein said non-sleep determinator comprises:

(a) a band-pass-filter for filtering said series of cardiac R-R intervals, thereby providing a second series of signals; and

(b) an arousal period definer for defining said at least one arousal period as a plurality of epochs each associated with at least one of said second series of signals which is below a predetermined threshold.

271. The system of claim 270, wherein said band-pass-filter is characterized by a lower band limit of about 0.05 Hz and an upper band limit of about 0.2 Hz.

272. The system of claim 270, wherein said predetermined threshold is about 0.85 of an averaged value of said second series of signals.

273. The system of claim 266, wherein said predetermined profile is characterized by a specific width and a specific depth.

274. The system of claim 240, wherein said EMG extractor comprises an eliminator for eliminating at least one signal selected from the group consisting of: a P wave, a T wave and a QRS-complex.

275. The system of claim 274, wherein said eliminator comprises at least one high pass filter for filtering out said P wave and said T wave.

276. The system of claim 275, wherein said high pass filter is characterized by a threshold frequency of about 10 Hz.

277. The system of claim 274, wherein said eliminator is operable comprises to eliminate said QRS-complex by a combination of gating and/or subtraction.

278. The system of claim 240, wherein said plurality of EMG parameters are selected from the group consisting of: normalized amplitude (mrEMG), normalized mean power (nPWR), zero-crossing average (ZC), median frequency (MF), mean power frequency (MPF), Expected Zero Crossing (EZC), power variance (PVAR), turns (NT) and Complexity (Cmplx).

279. The system of claim 240, wherein said REM determinator is programmed to define the REM period by a plurality of epochs, each characterized by at least one of said plurality of EMG parameters which is below a predetermined threshold.

280. The system of claim 240, wherein said Stage-2 determinator is programmed to define said at least one Stage-2 period by a plurality of epochs, each associated to a cardiac R-R interval corresponding to a K-complex.

281. The system of claim 280, wherein said cardiac R-R interval corresponding to said K-complex is characterized by a specific width and a specific depth.

282. An apparatus for determining a body position or a change in the body position from signals of electrical activity recorded of a chest of a sleeping subject, the signals being QRS complexes, the apparatus comprising:

an R-wave duration (RWD) extractor for extracting R-wave durations from the QRS complexes, thereby to obtain an R-wave duration function

a body position determinator for determining the body position or the change in the body position of the sleeping subject using said RWD function.

283. The apparatus of claim 282, wherein said RWD extractor is operable to define the change in the body position when a change of said RWD function is above a predetermined threshold.

284. The apparatus of claim 283, wherein said predetermined threshold is a standard deviation of said RWD function.

285. The apparatus of claim 283, wherein said body position determinator is operable to calculate at least one local average of said RWD function.

286. The apparatus of claim 283, wherein said body position determinator is operable to calculate a difference between two local averages of said RWD function.

287. The apparatus of claim 282, wherein the body position is one of two body positions.

288. The apparatus of claim 287, wherein said body position determinator is operable to define a first body position, when a value of said RWD function is high and a second body position, when a value of said RWD function is low.

289. The apparatus of claim 282, further comprising a segment calculator for defining at least two segments of each of the QRS complexes and determining width of each of said at least two segments, thereby to obtain, for each QRS complex, a set of widths, said set being representative of the body position.

290. The apparatus of claim 289, wherein said segment calculator is operable to calculate nth-order derivatives of R-waves of said QRS complex, where n is a positive integer, and further wherein said segment calculator is operable to locate zeros of said nth-order derivatives.

291. The apparatus of claim 282, wherein said at least two segments comprise a left segment and a right segment and the body position is one of four body positions.

292. The apparatus of claim 291, wherein said body position determinator is operable to define:

a first body position, when a value of said left segment is high and a value of said right segment is high;

a second body position, when a value of said left segment is low and a value of said right segment is high;

a third body position, when a value of said left segment is high and a value of said right segment is low; and

a fourth body position, when a value of said left segment is low and a value of said right segment is low.

293. An apparatus of characterizing a sleep of a sleeping subject, the apparatus comprising:

an autonomic balance index (ABI) calculator, for calculating at least one ABI, each corresponding to a different sleep stage of the sleeping subject, said ABI calculator is operable to calculated said ABI using a weight of said sleep stage and at least one power parameter; and

a sleep characterizer for characterizing the sleep of the sleeping subject using said at least one ABI.

294. The apparatus of claim 293, further comprising an obstructive sleep apnea determinator, for determining an obstructive sleep apnea for the sleeping

subject if one or more of said at least one ABI is larger than a predetermined threshold.

295. The apparatus of claim 293, wherein said ABI calculator is operable to sum said at least two ABIs thereby to provide a total ABI.

296. The apparatus of claim 295, further comprising an obstructive sleep apnea determinator, for determining an obstructive sleep apnea for the sleeping subject if said total ABI is larger than a predetermined threshold.

297. The apparatus of claim 293, wherein said at least one power parameter is selected from the group consisting of a very-low-frequency (VLF) power spectrum, a low-frequency (LF) power spectrum, a high-frequency (HF) power spectrum and a combination between two of said VLF, said LF and said HF power spectra.

298. The apparatus of claim 297, wherein said combination is a ratio.

299. The apparatus of claim 293, wherein said sleep stage is selected from the group consisting of a Slow-Wave-Sleep (SWS), Rapid-Eye-Movement (REM) sleep and a light-sleep (LS).

300. The apparatus of claim 299, further comprising:

an R-R extractor, for extracting a series of cardiac R-R intervals from signals of electrical activity recorded of a chest of the sleeping subject;

a decomposer, for obtaining a time-frequency decomposition from said series of cardiac R-R intervals; and

an SWS determinator for using said time-frequency decomposition to determine periods of said SWS.

301. The apparatus of claim 299, further comprising

an electromyogram (EMG) extractor, for extracting a plurality of EMG parameters from signals of electrical activity recorded of a chest of the sleeping subject;

said portion corresponds to a NSWS period other than said at least one SO period and other than said plurality of non-sleep period;

a REM determinator for using said plurality of EMG parameters to determine periods of said REM sleep.

302. The apparatus of claim 299, further comprising

an R-R extractor, for extracting a series of cardiac R-R intervals from signals of electrical activity recorded of a chest of the sleeping subject;

a plotter, for constructing a Poincare plot of said series of cardiac R-R intervals; and

a REM determinator, for using said Poincare plot to determine periods of said REM sleep.

303. The apparatus of claim 300, further comprising:

a sleep-onset (SO) determinator for determining periods of SO from said signals;

a non-sleep determinator for determining periods of non-sleep from said signals;

an electromyogram (EMG) extractor, for extracting a plurality of EMG parameters from a portion of the signals, said portion corresponding to periods other than said SWS periods, other than said SO periods and other than said non-sleep periods;

a REM determinator for using said plurality of EMG parameters to determine periods of said REM sleep, thereby to obtain also periods of said LS defined as periods other than said SWS periods, other than said SO periods, other than non-sleep periods and other than said REM periods.

304. An apparatus for determining a sleep apnea from signals of electrical activity recorded of a chest of a sleeping subject, the signals being measured over a plurality of epochs, the apparatus comprising:

an R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a non-sleep determinator for determining awakening periods of the sleeping subject and excluding cardiac R-R intervals corresponding to said awakening periods from said series of cardiac R-R intervals;

a decomposer for calculating a power spectrum from said series of cardiac R-R intervals; and

a sleep apnea determinator for using said power spectrum and determining the sleep apnea of the sleeping subject.

305. The apparatus of claim 304, further comprising a body positions determinator for determining body positions or a change in a body position of the sleeping subject.

306. The apparatus of claim 304, wherein said non-sleep determinator comprises:

(a) a low-pass filter for filtering said series of cardiac R-R intervals, thereby to provide a first series of signals; and

(b) an awakening period definer for defining said at least one awakening period as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

307. The apparatus of claim 306, wherein said low-pass-filter is at about 0.01 Hz.

308. The apparatus of claim 306, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

309. The apparatus of claim 304, further comprising a discrete transformer for obtaining said power spectrum.

310. The apparatus of claim 309, wherein said discrete transformer is selected from the group consisting of a steady state discrete transformer and a time-dependent discrete transformer.

311. The apparatus of claim 309, wherein said discrete transformer is operable to perform a transform selected from the group consisting of a discrete Fourier transform, a discrete Hartley transform, a discrete sine transform, a discrete cosine transform, a discrete Hadamard transform, a discrete Haar transform and a discrete wavelet transform.

312. The apparatus of claim 304, wherein said sleep apnea determinator is operable to obtain a power spectrum component of said power spectrum, and to identify sleep apnea if said power spectrum component is above a predetermined threshold.

313. The apparatus of claim 312, wherein said power spectrum component is power of signals being at a frequency range representing sleep apnea.

314. The apparatus of claim 313, wherein said frequency range is from about 0.01 Hz to about 0.04 Hz.

315. The apparatus of claim 312, wherein said predetermined threshold is about half of a total power of said power spectrum.

316. The apparatus of claim 305, further comprising a pattern recognition functionality for identifying representative patterns of sleep apnea.

317. The apparatus of claim 316, wherein said representative patterns are characterized by a U-shape of said cardiac R-R intervals.

318. A system for determining a body position or a change in the body position of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, characterized by QRS complexes;

an R-wave duration (RWD) extractor for extracting R-wave durations from the QRS complexes, thereby to obtain an R-wave duration function

a body position determinator for determining the body position or the change in the body position of the sleeping subject using said RWD function.

319. The system of claim 318, wherein said RWD extractor is operable to define the change in the body position when a change of said RWD function is above a predetermined threshold.

320. The system of claim 319, wherein said predetermined threshold is a standard deviation of said RWD function.

321. The system of claim 319, wherein said body position determinator is operable to calculate at least one local average of said RWD function.

322. The system of claim 319, wherein said body position determinator is operable to calculate a difference between two local averages of said RWD function.

323. The system of claim 318, wherein the body position is one of two body positions.

324. The system of claim 323, wherein said body position determinator is operable to define a first body position, when a value of said RWD function is high and a second body position, when a value of said RWD function is low.

325. The system of claim 318, further comprising a segment calculator for defining at least two segments of each of the QRS complexes and determining width

of each of said at least two segments, thereby to obtain, for each QRS complex, a set of widths, said set being representative of the body position.

326. The system of claim 325, wherein said segment calculator is operable to calculate nth-order derivatives of R-waves of said QRS complex, where n is a positive integer, and further wherein said segment calculator is operable to locate zeros of said nth-order derivatives.

327. The system of claim 318, wherein said at least two segments comprise a left segment and a right segment and the body position is one of four body positions.

328. The system of claim 327, wherein said body position determinator is operable to define:

a first body position, when a value of said left segment is high and a value of said right segment is high;

a second body position, when a value of said left segment is low and a value of said right segment is high;

a third body position, when a value of said left segment is high and a value of said right segment is low; and

a fourth body position, when a value of said left segment is low and a value of said right segment is low.

329. A system for determining a sleep apnea of a sleeping subject, the system comprising:

an apparatus for providing signals of electrical activity of a chest of the sleeping subject, measured over a plurality of epochs;

an R-R extractor for extracting a series of cardiac R-R intervals from the signals;

a non-sleep determinator for determining awakening periods of the sleeping subject and excluding cardiac R-R intervals corresponding to said awakening periods from said series of cardiac R-R intervals;

a decomposer for calculating a power spectrum from said series of cardiac R-R intervals; and

a sleep apnea determinator for using said power spectrum and determining the sleep apnea of the sleeping subject.

330. The system of claim 329, further comprising a body positions determinator for determining body positions or a change in a body position of the sleeping subject.

331. The system of claim 329, wherein said non-sleep determinator comprises:

(a) a low-pass filter for filtering said series of cardiac R-R intervals, thereby to provide a first series of signals; and

(b) an awakening period definer for defining said at least one awakening period as a plurality of epochs each associated with at least one of said first series of signals which is below a predetermined threshold.

332. The system of claim 331, wherein said low-pass-filter is at about 0.01 Hz.

333. The system of claim 331, wherein said predetermined threshold is about 0.85 of an averaged value of said first series of signals.

334. The system of claim 329, further comprising a discrete transformer for obtaining said power spectrum.

335. The system of claim 334, wherein said discrete transformer is selected from the group consisting of a steady state discrete transformer and a time-dependent discrete transformer.

336. The system of claim 334, wherein said discrete transformer is operable to perform a transform selected from the group consisting of a discrete Fourier transform, a discrete Hartley transform, a discrete sine transform, a discrete cosine

transform, a discrete Hadamard transform, a discrete Haar transform and a discrete wavelet transform.

337. The system of claim 329, wherein said sleep apnea determinator is operable to obtain a power spectrum component of said power spectrum, and to identify sleep apnea if said power spectrum component is above a predetermined threshold.

338. The system of claim 337, wherein said power spectrum component is power of signals being at a frequency range representing sleep apnea.

339. The system of claim 338, wherein said frequency range is from about 0.01 Hz to about 0.04 Hz.

340. The system of claim 337, wherein said predetermined threshold is about half of a total power of said power spectrum.

341. The system of claim 330, further comprising a pattern recognition functionality for identifying representative patterns of sleep apnea.

342. The system of claim 341, wherein said representative patterns are characterized by a U-shape of said cardiac R-R intervals.